



USA



INVESTOR IN PEOPLE

The Patent Office  
Concept House  
Cardiff Road  
Newport  
South Wales  
NP10 8QQ

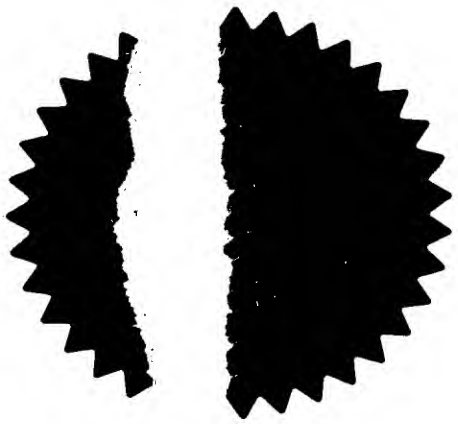


I, the undersigned, being an officer duly authorised in accordance with Section 74(1) and (4) of the Deregulation and Contracting Out Act 1994, to sign and issue certificates on behalf of the Comptroller-General, hereby certify that annexed hereto is a true copy of the documents as originally filed in connection with the patent application identified therein together with the Statement of inventorship and of right to grant of a Patent (Form 7/77), which was subsequently filed.

In accordance with the Patents (Companies Re-registration) Rules 1982, if a company named in this certificate and any accompanying documents has re-registered under the Companies Act 1980 with the same name as that with which it was registered immediately before re-registration save for the substitution as, or inclusion as, the last part of the name of the words "public limited company" or their equivalents in Welsh, references to the name of the company in this certificate and any accompanying documents shall be treated as references to the name with which it is so re-registered.

In accordance with the rules, the words "public limited company" may be replaced by p.l.c., plc, P.L.C. or PLC.

Re-registration under the Companies Act does not constitute a new legal entity but merely subjects the company to certain additional company law rules.

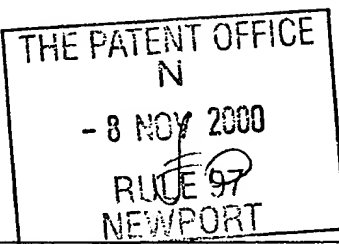


Signed

Dated 15 AUG 2001

# Request for grant of a patent

(See the notes on the back of this form. You can also get an explanatory leaflet from the Patent Office to help you fill in this form)



The Patent Office

Cardiff Road  
Newport  
Gwent NP9 1RH

1. Your reference

GAF/36972.GBA

2. Patent application number

(The Patent Office will fill in this part)

0027317.7

8 NOV 2000

3. Full name, address and postcode of the or of each applicant (underline all surnames)

NASTECH EUROPE LIMITED,  
Torrington Avenue,  
Coventry. CV4 9AE

Patents ADP number (if you know it)

6781454001

If the applicant is a corporate body, give the country/state of its incorporation

Coventry, U.K.

4. Title of the invention

COLLAPSIBLE STEERING COLUMN ASSEMBLY  
FOR A VEHICLE

5. Name of your agent (if you have one)

"Address for service" in the United Kingdom to which all correspondence should be sent (including the postcode)

RAWORTH MOSS & COOK,  
36 Sydenham Road,  
Croydon, Surrey. CR0 2EF  
United Kingdom

0001362001

Patents ADP number (if you know it)

6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and (if you know it) the or each application number

Country

Priority application number  
(if you know it)

Date of filing  
(day / month / year)

7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application

Number of earlier application

Date of filing  
(day / month / year)

8. Is a statement of inventorship and of right to grant of a patent required in support of this request? (Answer 'Yes' if:

Yes

- a) any applicant named in part 3 is not an inventor, or
  - b) there is an inventor who is not named as an applicant, or
  - c) any named applicant is a corporate body.
- See note (d))

# Patents Form 1/77

9. Enter the number of sheets for any of the following items you are filing with this form. Do not count copies of the same document

Continuation sheets of this form

Description	5
Claim(s)	2
Abstract	1
Drawing(s)	2

10. If you are also filing any of the following, state how many against each item.

Priority documents

Translations of priority documents

Statement of inventorship and right to grant of a patent (Patents Form 7/77) 1 + 1 copy

Request for preliminary examination and search (Patents Form 9/77) 1

Request for substantive examination (Patents Form 10/77)

Any other documents (please specify)

11. I/We request the grant of a patent on the basis of this application.

Raworth Moss & Cook.

Signature

Date

RAWORTH MOSS & COOK

7th November 2000

12. Name and daytime telephone number of person to contact in the United Kingdom

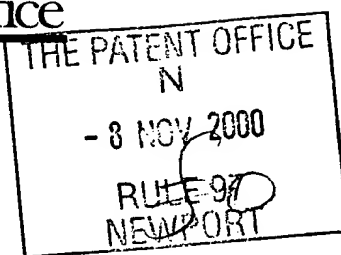
FEAKINS - 020-8688-8318

## Warning

After an application for a patent has been filed, the Comptroller of the Patent Office will consider whether publication or communication of the invention should be prohibited or restricted under Section 22 of the Patents Act 1977. You will be informed if it is necessary to prohibit or restrict your invention in this way. Furthermore, if you live in the United Kingdom, Section 23 of the Patents Act 1977 stops you from applying for a patent abroad without first getting written permission from the Patent Office unless an application has been filed at least 6 weeks beforehand in the United Kingdom for a patent for the same invention and either no direction prohibiting publication or communication has been given, or any such direction has been revoked.

## Notes

- If you need help to fill in this form or you have any questions, please contact the Patent Office on 0645 500505.
- Write your answers in capital letters using black ink or you may type them.
- If there is not enough space for all the relevant details on any part of this form, please continue on a separate sheet of paper and write "see continuation sheet" in the relevant part(s). Any continuation sheet should be attached to this form.
- If you have answered 'Yes' Patents Form 7/77 will need to be filed.
- Once you have filled in the form you must remember to sign and date it.
- For details of the fee and ways to pay please contact the Patent Office.



# Statement of inventorship and of right to grant of a patent

The Patent Office

Cardiff Road  
Newport  
Gwent NP9 1RH

1. Your reference

GAF/36972.GBA

2. Patent application number  
(if you know it)

**0027317.7**

**- 8 NOV 2000**

3. Full name of the or of each applicant

NASTECH EUROPE LIMITED

4. Title of the invention

COLLAPSIBLE STEERING COLUMN ASSEMBLY  
FOR A VEHICLE

5. State how the applicant(s) derived the right  
from the inventor(s) to be granted a patent

By virtue of an employment contract

6. How many, if any, additional Patents Forms  
7/77 are attached to this form?  
(see note (c))

1

7.

I/We believe that the person(s) named over the page (and on  
any extra copies of this form) is/are the inventor(s) of the invention  
which the above patent application relates to.

Signature

Date

*Raworth Moss & Cook*

RAWORTH MOSS & COOK

7th November 2000

8. Name and daytime telephone number of  
person to contact in the United Kingdom

FEAKINS - 020-8688-8318

## Notes

- If you need help to fill in this form or you have any questions, please contact the Patent Office on 0645 500505.
- Write your answers in capital letters using black ink or you may type them.
- If there are more than three inventors, please write the names and addresses of the other inventors on the back of another Patents Form 7/77 and attach it to this form.
- When an application does not declare any priority, or declares priority from an earlier UK application, you must provide enough copies of this form so that the Patent Office can send one to each inventor who is not an applicant.
- Once you have filled in the form you must remember to sign and date it.

Enter the full names, addresses and postcodes of the inventors in the boxes and underline the surnames

Patrick Anthony DUFFY,  
56 Braunstone Close,  
Leicester. LE3 2GT

Patents ADP number (if you know it): 8018137001

Patents ADP number (if you know it):

**Reminder**

Have you signed the form?

Patents ADP number (if you know it):

COLLAPSIBLE STEERING COLUMN ASSEMBLY FOR A VEHICLE

This invention relates to a collapsible steering column assembly for a vehicle.

5

10

A vehicle steering column assembly is required to collapse in a controlled manner in the event of a vehicle crash. During a crash event, the steering column assembly should be able to accommodate collapse from the front of the vehicle, for example in order to accommodate intrusion of an engine compartment firewall and, in addition, the assembly should also be able to collapse away from the driver of the vehicle.

15

20

According to the present invention, there is provided a collapsible steering column assembly for a vehicle, the assembly including a steering column mounting bracket itself being mountable on a vehicle body part, there being a deformable component that is joined to the mounting bracket and that can collapse in the event of vehicle crash thereby to absorb energy.

25

The deformable component can be integral with the mounting bracket.

30

The mounting bracket can support upper and lower subassemblies of a steering column. The upper and lower subassemblies can be slidably mounted one on the other.

The deformable component may be restrained in its normal positional relationship with the mounting bracket by at least one locating means. The locating means can comprise at least one slot in one of the mounting bracket or the deformable component and a locating pin on the

other of the mounting bracket or deformable component. There may be two such slots and mating pins. The or each slot may be an open slot.

5           The deformable component can comprise at least one stiff strip so configured as to provide a region of weakness about which the strip can be bent and thus collapsed upon receiving a compressive force along the length of the strip. One end of the strip may be joined  
10           to the mounting bracket and the other, free end of the strip may form a mounting for a pivot member. The pivot member may support a universal joint bearing assembly of the steering column.

15           The steering column assembly may provide for rake and/or reach adjustment of the steering column.

            For a better understanding of the invention and to show how the same may be carried into effect, reference  
20           will now be made, by way of example, to the accompanying drawings, in which:-

            Fig. 1 is a diagrammatic perspective view of part of a collapsible steering column assembly shown in a  
25           condition before a vehicle crash; and

            Fig. 2 is a view similar to Fig. 1 but showing the assembly in a condition that it can adapt after a vehicle  
            crash.

30

            The steering column assembly includes upper and lower column subassemblies 1, 2, which are slidable one within the other, relative rotation between the two subassemblies being prevented, for example, by a spline

interface (not shown). A steering wheel (not shown) will be attached to the upper end of the upper subassembly 1, whilst the lower end of the lower subassembly 2 is coupled to a pivot member 3 in the form of a bracket, the pivot member 3 carrying a yoke of a universal joint.

The pivot member 3 is pivotally linked by pins 4 to part of a steering column mounting bracket 5 that is fixedly mountable on a vehicle body part such as a cross-beam (not shown).

The upper subassembly 1 includes an upper steering column tube 6 mounted on a support bracket 7 that is itself slidably mounted on a second, support bracket 8 so as to allow, in normal operating conditions of the steering column assembly, reach and/or rake adjustment of the steering column. Means (not shown) are provided therefore to clamp the support bracket 8 to the support bracket 7 once the reach and/or rake adjustment of the steering column has been made.

As mentioned, in the event of vehicle crash, the steering column assembly should be able to accommodate collapse from the front, i.e. by intrusion of a firewall (not shown) and this is arranged to act on a deformable component 9 in the form of two metal strips 9A extending from the mounting bracket 5 itself.

In the embodiment shown, it will be seen that the two strips 9A are actually part of the mounting bracket 5 but each is split from it in the regions indicated by the reference numerals 10 but is fixed on itself in those regions 10 by devices 11. These devices 11 are in fact



pins which are fitted in respective open, angled slots 12 (Fig. 2) in an upper plate of the mounting bracket 5.

5 Each strip 9A is provided with bent or crimped regions 9B which provide regions of weakness to allow the strips 9A forming the deformable component to collapse in the event of end-on forces on the strips.

10 Accordingly, the steering column assembly is connected to the mounting bracket 5 through the pivot bracket 3 and the deformable component 9. The regions 9B of the deformable component of the mounting bracket therefore have predefined configurations which, in normal use, have no effect on the function of the steering  
15 column.

However, in the event of vehicle crash, the forces generated will be sufficient to act on the deformable component 9 and thereby allow for intrusion of the  
20 firewall. As can be seen in Figure 2, the forces generated will dislocate the locating pins 11 from their retaining slots 12, which are angled towards the direction of applied force so that the pins are released and the deformable regions 9B of the strips 9A initiate  
25 the deformable component 9 to collapse on itself. This thereby allows the firewall to displace the lower (front) end of the mounting bracket 5 and also any brackets connected in this area, such as the pivot bracket 3.

30 The locating points comprising the pins 11 and slots 12 can be formed as clamping devices to provide further controlled load in the region of the deformable component.

It will be appreciated that the present arrangement allows for a predefined collapse direction to be achieved whilst enabling a predictable system to be constructed as regards loads generated. Also, intrusion displacement of the firewall can be achieved thereby without the requirement of additional brackets, for example.

CLAIMS

1. A collapsible steering column assembly for a vehicle, the assembly including a steering column mounting bracket itself being mountable on a vehicle body part, there being a deformable component that is joined to the mounting bracket and that can collapse in the event of vehicle crash thereby to absorb energy.

2. An assembly according to claim 1, wherein the deformable component is integral with the mounting bracket.

3. An assembly according to claim 1 or 2, wherein the mounting bracket supports upper and lower subassemblies of the steering column.

4. An assembly according to claim 3, wherein the upper and lower subassemblies are slidably mounted one on the other.

5. An assembly according to any one of the preceding claims, wherein the deformable component is restrained in its normal positional relationship with the mounting bracket by at least one locating means.

6. An assembly according to claim 5, wherein the locating means comprises at least one slot in one of the mounting bracket or the deformable component and a locating pin on the other of the mounting bracket or deformable component.

7. An assembly according to claim 6, wherein there are two such slots and locating pins that mate with their respective slots.

5           8. An assembly according to claim 6 or 7, wherein the or each slot is an open slot.

10           9. An assembly according to any one of the preceding claims, wherein the deformable component comprises at least one stiff strip so configured as to provide a region of weakness about which the strip can be bent and thus collapsed upon receiving a compressive force along the length of the strip.

15           10. An assembly according to claim 9, wherein one end of the strip is joined to the mounting bracket and the other, free end of the strip forms a mounting for a pivot member.

20           11. An assembly according to claim 10, wherein the pivot member supports a universal joint bearing assembly of the steering column.

25           12. An assembly according to any one of the preceding claims and having provision for rake and/or reach adjustment of the steering column.

30           13. A collapsible steering column assembly for a vehicle, substantially as hereinbefore described, with reference to the accompanying drawings.

ABSTRACT

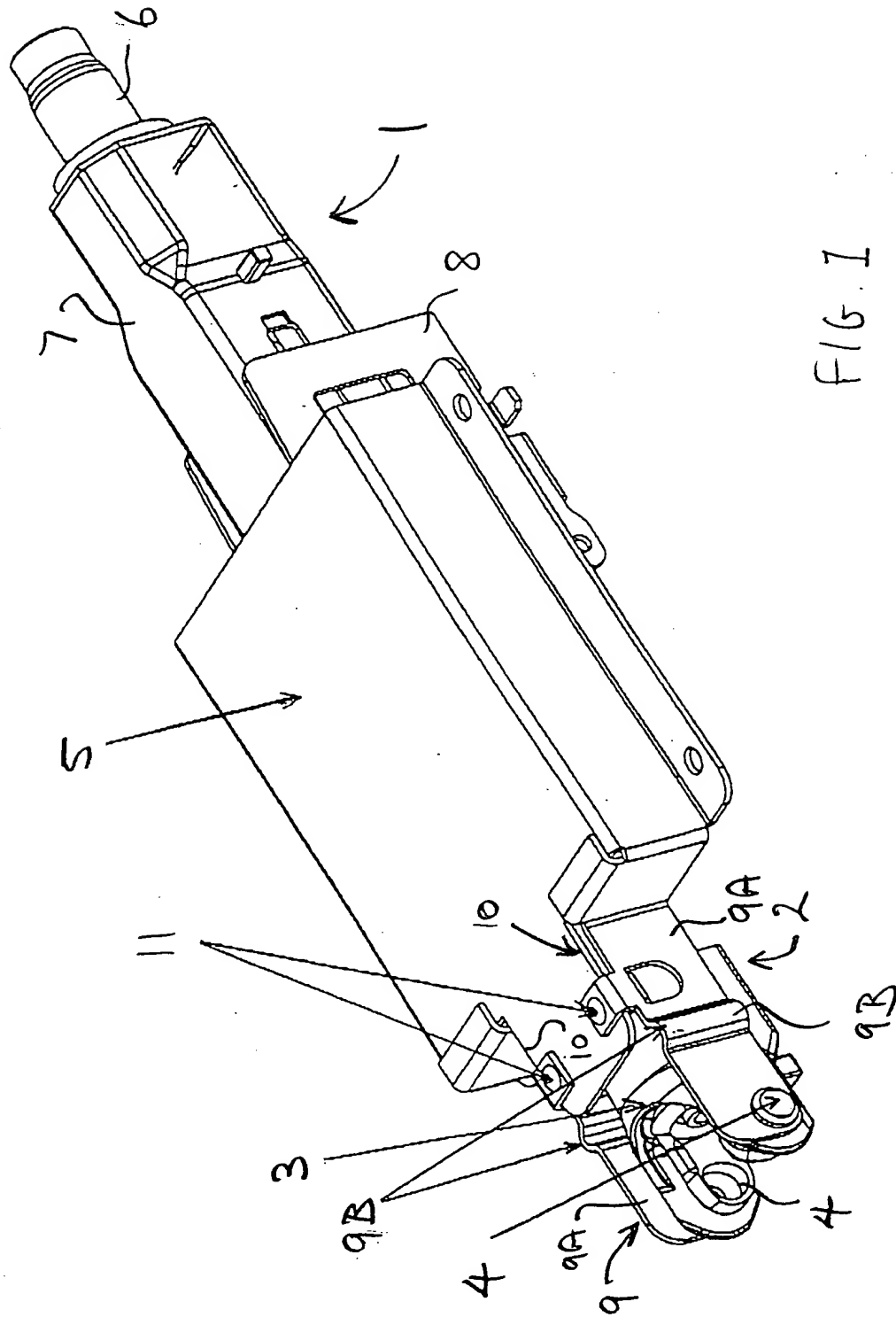
COLLAPSIBLE STEERING COLUMN ASSEMBLY FOR A VEHICLE

5           A collapsible steering column assembly includes  
a steering column mounting bracket (5) with a deformable  
component (9) that is joined to the mounting bracket and  
that can collapse in the event of vehicle crash thereby  
to absorb energy.   The deformable component (9) is  
10 restrained in a normal position by locating means (11,  
12) and is provided with regions 9B of weakness to allow  
collapse.   The provision of such deformable means  
actually in the mounting bracket itself eliminates the  
need for additional brackets, for example, to achieve the  
15 same purpose.

(Fig.2)

1/2

BEFORE CRASH



AFTER CRASH

